UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

DATE: AUG 1 2 1996

SUBJECT: Removal Site Evaluation for LCP Chemicals, Inc., Division of Hanlin Group, Linden, Union County, New Jersey

FROM: Nick Magriples, CHMM, On-Scene Coordinator N. Magriples

TO: Removal Action Branch

File

Site I.D. No.: ZZ
REMOVAL ASSESSMENT RANKING: not eligible

I. INTRODUCTION

The Removal Action Branch received a verbal request from the Pre-remedial Section in January, 1996 to evaluate LCP Chemicals, Inc. for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Removal Action consideration. The request was focused on the former lagoon area.

There has been a release of CERCLA designated Hazardous Substances at LCP Chemicals, Inc. Elevated levels of mercury are present in the soil, sediment, and nearby surface waters due to past disposal practices at the Site. However, based on the available information, LCP Chemicals, Inc. is not eligible for a CERCLA Removal Action at this time. According to the New Jersey Department of Health and the Agency for Toxic Substances and Disease Registry, there are no completed or anticipated human exposure pathways associated with the Site under present conditions. Furthermore, there are no defined acute ecological threats which warrant a CERCLA Removal Action at this time.

The Site is currently undergoing further study under the pre-remedial site assessment program for potential National Priorities List (NPL) consideration.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Physical location

LCP Chemicals, Inc. (Site) is situated off of South Wood Avenue on the Tremley Point peninsula, in Linden, Union County, New Jersey (see Figure 1). The Site, which occupies 26 acres on filled marshland and is located in an industrial area, is bordered by the South Branch Creek to the east; GAF Corporation to the north; and Northville Industries, BP Corporation, and Mobil to the northeast, south, and west, respectively.

It is estimated that 38 persons reside within one-half mile of the Site, with the nearest residential home being approximately one-half mile west on South Wood Avenue. The distance from the entrance to the Site from South Wood Avenue via paved roadway is estimated to be at least one mile.

The South Branch Creek, a tributary to the Arthur Kill, appears to arise onsite and flows approximately 1,000 feet along the eastern border of the Site before discharging into the Arthur Kill. The Arthur Kill is classified as "Saline Estuarine Waters: SE2" and is reportedly used for recreational boating. The Arthur Kill, which is tidally influenced, flows south for approximately 10 miles where it discharges into the Raritan Bay. The Site is located within the 100-year floodplain. River and coastal tidal water wetlands exist in the immediate vicinity of the Site.

The Peregrine Falcon, northern harrier, great blue heron, yellow-crowned night heron, and little blue heron, all state-listed species, are reported to either breed or hunt in the salt marshes near the Site. Prall's Island, located approximately 1,000 feet east of the mouth of the South Branch Creek, is a breeding area and rookery for some of these birds. Currently, a habitat restoration project is ongoing at Prall's Island and other nearby salt marshes as part of the mitigation for the 1990 Bayway Refinery oil spill. No terrestrial sensitive environments have been identified on or within 200 feet of the Site.

It is reported that ground water is not utilized as a source of potable water with four miles of the Site. Surface water is the primary source for potable water usage within four miles of the Site. The surface water sources for this area are not located in the Site's surface water pathway nor are they impacted by the Site.

2. Site characteristics

The LCP Chemicals Linden facility (see Figure 2) was used from 1972 to 1985 to produce chlorine using a mercury cell electrolysis process. The facility is owned by Hanlin Group, Inc. of Edison, New Jersey. Prior to 1972, GAF had produced chlorine and sodium hydroxide at this location since 1952. GAF had purchased the land from the U.S government in 1950, filled an area of marshland and lowland, and developed it.

When LCP Chemicals purchased the site they continued using the same chlorine processing method already being used with a few minor modifications. During operations, LCP Chemicals manufactured 500 tons of chlorine per day. The company also produced sodium hydroxide, hydrochloric acid and anhydrous hydrochloric acid. In the early 1980s the plant was converted to produce potassium hydroxide and operated briefly before it permanently ceased production operations at the plant in 1985.

In the period prior to 1994, when the Linden facility was vacated, the Site was used as a transfer terminal for products from other Hanlin Group facilities. Products including potassium hydroxide, sodium hydroxide and hydrochloric acid arrived in bulk by rail and truck and were transferred to aboveground tanks and tank trucks. The plant was dismantled during the period between 1985 to 1994.

The mercury cell electrolytic process involved the electrolysis of a sodium chloride (brine) solution in the presence of metallic mercury. Metallic mercury was partially recovered and recycled in a brine purification process. The remaining mercury-contaminated sludge was placed into an on-site lagoon (Brine Sludge Lagoon) located in an area between the fenced-in operations portion of the LCP facility and the adjacent Northville facility. The supernatant from the lagoon was collected and piped to the site wastewater treatment plant for treatment prior to being discharged to the South Branch Creek via the company's New Jersey Pollutant Discharge System (NJPDES) permit. The sludge, which contained amongst other constituents, barium and mercury, was left in the lagoon. It is reported that the sludge accumulated for more than 20 years prior to the lagoon's closure under the Resource Conservation and Recovery Act (RCRA) in 1984.

The former Brine Sludge Lagoon, now a landfill, is approximately 200 feet long by 150 feet wide by 20 to 25 feet high. The total volume of sludge stored in the lagoon is estimated to be nearly 31,000 cubic yards. As part of the closure of the lagoon, it was reportedly dewatered; compacted; capped with a two-foot layer of clay, six inches of drainage media, six inches of soil; and vegetated. The cover is reportedly inspected and maintained as part of the closure plan.

3. Site assessment activities/observations

The following EPA personnel were directly involved in the Removal Assessment conducted for LCP Chemicals, Inc.: Nick Magriples and Robert Montgomery of the Removal Action Branch (RAB).

A site visit conducted on August 18, 1994 for a previous Removal Site Evaluation (September 9, 1994) revealed that the company was preparing to leave the Site. According to company officials at that time, LCP was in Chapter 11 bankruptcy and had sold all of its operating assets. At the time of the site visit, all employees were reportedly expected to be off the facility by the end of August, 1994. Two small businesses lease a portion of the buildings near the entrance. Union Carbide reportedly leased a portion of the Site from the time period when GAF owned the property till 1990.

Site visits on March 26, 1996 and May 2, 1996 revealed that

access to the LCP Chemicals property was readily available. A tank cleaning company currently leases several structures from the owners of the property and operate near the entrance to the Site. Indications of vandalism are evident in portions of the vacant facility. Except for a Northville Industries oil tank farm, there does not appear to be any occupied structures present around the Site for at least one-quarter mile.

A fence and rail line separate the main portion of the former operations from the location of the impoundment on one side. The gate on this fence has been discovered open on both visits and apparently is not locked. The gates on the fences separating the impoundment area from the adjoining petroleum tank farms on the northern and southern ends appear to be kept unlocked for an access road for the tank farms. This unpaved road passes directly adjacent to the berm of the lagoon. The impoundment, which itself is encircled by a smaller unpaved path branching off of the access road, rises approximately 30 feet in elevation above this roadway. The sides of the impoundment are vegetated with grass and weeds. Some erosion of the impoundment's berms was observed on all sides.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

Through the years there have been several documented significant releases of brine from the impoundment onto the ground surface and into the South Branch Creek. In 1979, a sodium chloride solution contaminated with inorganic mercury overflowed from the process and the wastewater system resulting in a release of an estimated 10,000 to 20,000 gallons of this material into the South Branch Creek.

During installation of monitoring wells in 1982, mercury was discovered in the soil at 0-2 feet in depth at concentrations ranging from 36 mg/kg to 772 mg/kg. Surface soils (actual depth unknown) collected from the perimeter of the lagoon at that time indicated mercury levels ranging from 27 mg/kg to 1,580 mg/kg.

On January 11, 1995, an EPA pre-remedial contractor collected three surface soil samples (0-6 inches), ten surface water samples, and eight sediment samples. The highest level of mercury noted in the surface soils was 110 mg/kg. The average concentration of mercury in the downstream sediments of the South Branch Creek was 500 mg/kg. The highest concentration was 1,060 mg/kg. Mercury was detected in the surface water at 93 ug/l near the facility's outfall. Arsenic was also present in most of the samples. The arsenic concentration in the surface water and sediment was 336 ug/l and 318 mg/kg, respectively. The highest level in the soil was 17 mg/kg. Zinc, copper, lead, and cadmium were also noted in these samples.

The materials listed above are CERCLA designated Hazardous Substances, as listed in 40 CFR Table 302.4. The above data is only a summary of the more pertinent analytical information. It is not meant to be inclusive of all of the analytes or compounds detected.

The mechanism for past releases to the environment is based upon the discharge of wastewaters and sludges into the impoundment and the subsequent releases from the impoundment to the ground surface and South Branch Creek. Limited construction information is available for the former impoundment.

Currently, the contaminated soil and sediment remains unmitigated. Leaching of contaminants into South Branch Creek is ongoing. The flow of contaminants into the Arthur Kill is not defined at this time. Prall's Island, a breeding area and rookery located approximately 1,000 feet from the South Branch Creek discharge into the Arthur Kill, could be impacted. Ground water may be impacted from leakage of contaminants into the subsurface.

5. NPL status

The Site is currently not an NPL site. A Site Inspection (SI) has been completed. Further pre-remedial activities are expected. The Site was evaluated by NJDOH/ATSDR on June 24, 1996.

B. Other Actions to Date

1. Previous actions

There have been no other previous Federal or private party actions taken at the Site.

2. Current actions

Currently, there are no Federal actions taking place at the Site.

C. State and Local Authorities' Role

1. State and local actions to date

There have been no State or local actions taken at the Site.

2. Potential for continued State/local response

At this time it is not known whether there will be any future State or local actions taken at the Site.

III. THREAT TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

Elevated levels of mercury, a CERCLA designated hazardous substance, are present in the soils, sediments, and surface waters in and around the Site. Migration appears to be occurring into the South Branch Creek, and potentially to the Arthur Kill and nearby wetlands. Although it is possible, it is not likely that the public will come into contact with the contaminated soil. According to the New Jersey Department of Health (NJDOH) and Agency for Toxic Substances and Disease Registry (ATSDR), there are no completed or anticipated human exposure pathways associated with the Site under present conditions (see Attachment A).

B. Threats to the Environment

A screening-level ecological risk assessment was completed (July 3, 1996) by personnel from the U.S. EPA Environmental Services Division (see Attachment B). A comparison of surface water inorganic contaminant levels to available screening values indicates that there is a potential for acute effects to aquatic biota for the length of South Branch Creek, depending on the influence of tides and flow rates at any given time. A comparison of sediment inorganic contaminant levels to available screening values indicates that there is a potential for significant impact throughout the creek system. Mercury is a mutagen, teratogen, and carcinogen, and causes embryocidal, cytochemical, and histopathological effects.

If marine species are present in South Branch Creek, then they could introduce contamination into the food chain through at least two pathways: accumulation of contaminants by young marine species that may be carried into the food chain, and accumulation by any aquatic or benthic species that may be consumed by avian piscivores. As noted in Section II.A.1. of this report, there are several important avian habitats located near the site.

It should be noted that the potential for realization of these potentially acute effects is based on, but not limited to, the assumptions that South Branch Creek is a tidal tributary and wetland with ecological value, and that it is used by estuarine aquatic species for all life stages, as well as by marine species for spawning and nursery habitat. The actual use of the creek by these species would depend on the specific characteristics of the creek channel and wetlands, even if contamination is not considered.

IV. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

This section is not applicable at this time.

V. CONCLUSIONS

LCP Chemicals, Inc. is not eligible for a CERCLA Removal Action at this time since there are no completed or anticipated human exposure pathways associated with the Site under present conditions and due to the currently indeterminate nature of the threat to the environment in an area that has been historically impacted from numerous industrial and municipal activities.

LCP CHEMICALS–NEW JERSEY, INC.
A DIVISION OF HANLIN GROUP, INC.
LINDEN, NEW JERSEY

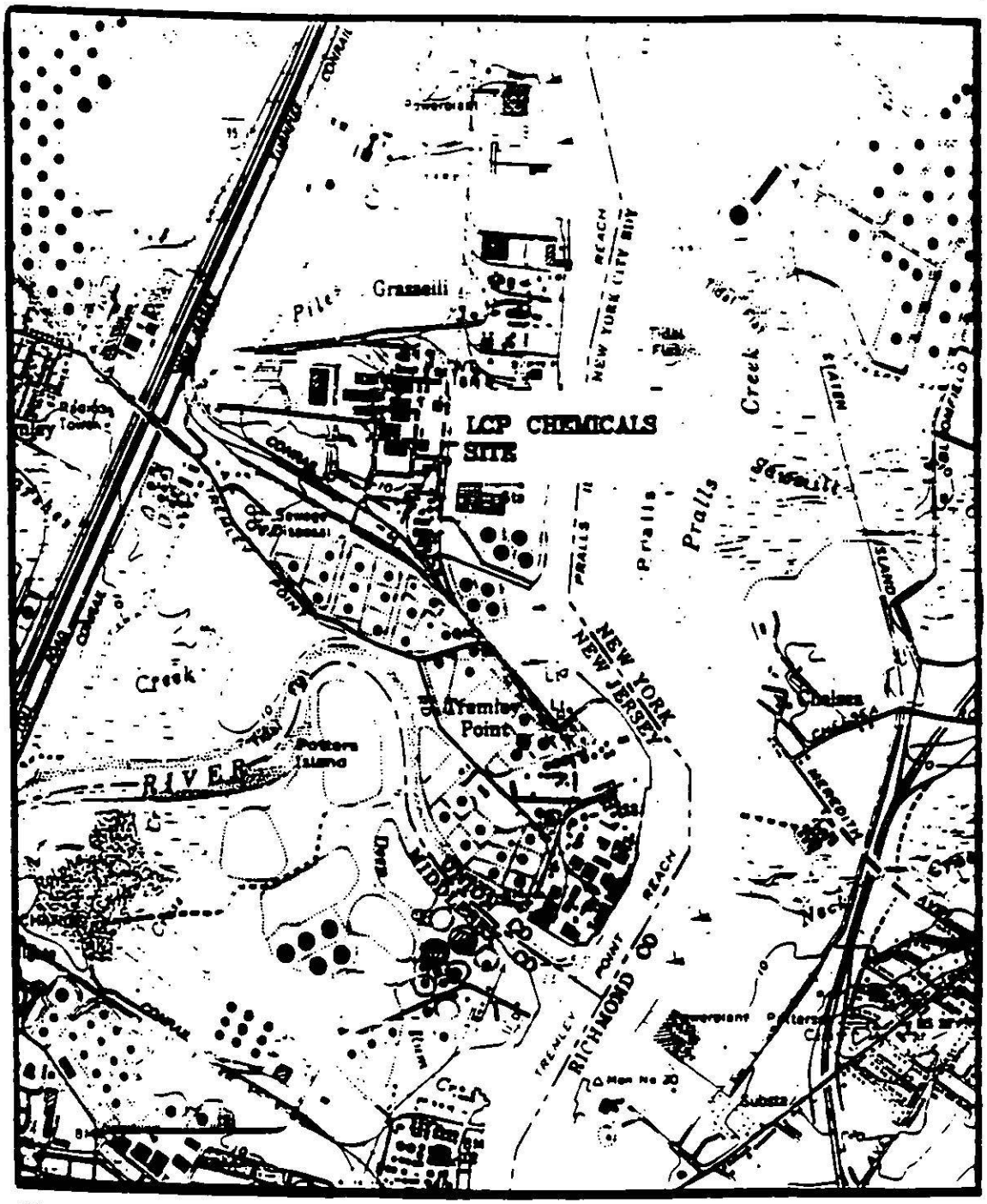

FIGURE 1: SITE LOCATION MAP

Note: This Figure was adapted from the 1992 RCRA Facility Inspection Report prepared for the LCP Chemical site by Eder Associates Consulting Engineers, P.C. (Ref. No. 15).

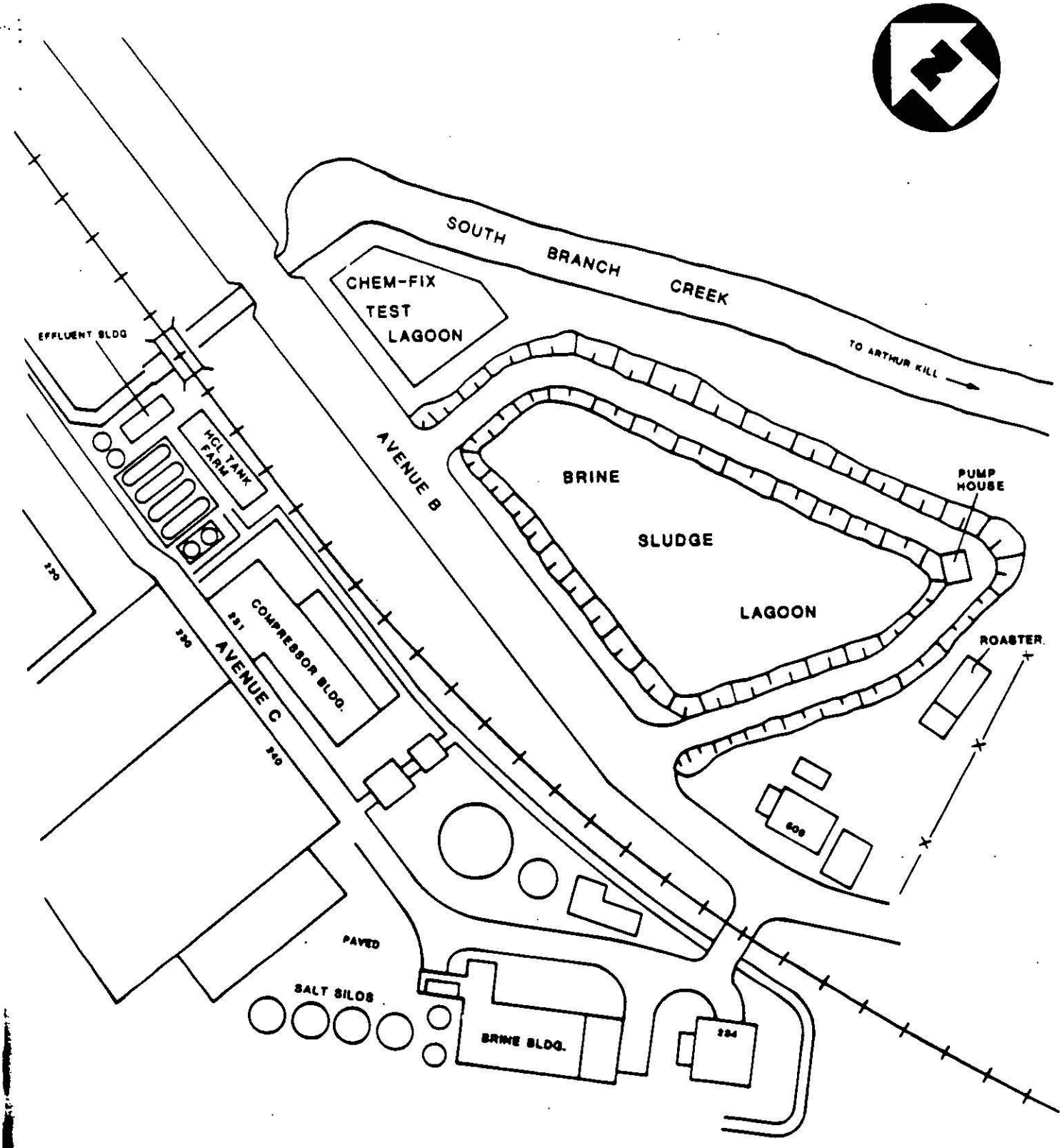

FIGURE A-2

SITE MAP

LCP CHEMICALS SITE, LINDEN, N.J.

SCALE: 1" = APPROX. 100'

NUS CORPORATION

A Halliburton Company

Attachment A

State of New Jersey
DEPARTMENT OF HEALTH
CN 360
TRENTON, N.J. 08625-0360

CHRISTINE TODD WHITMAN
GOVERNOR

LEN FISHMAN
COMMISSIONER OF HEALTH

TO: David Hutchins; ATSDR, Technical Project Officer

FROM: James Pasqualo; NJDOH, ATSDR Project Manager

DATE: June 24, 1996

SUBJECT: Site Visit Report; LCP Chemical Site

Attached is a site visit report package regarding the *LCP Chemical* site. Included in this package are:

1) A site summary checklist.
2) Site narrative.
3) A site location map (coordinates 40' 36.43" N, 74'12.62" W)

The NJDOH performed a site visit at the LCP Chemical site on May 2, 1996. This was in response to a request from the United States Environmental Protection Agency to ascertain the nature and extent of potential human exposure pathways at the site.

It is our evaluation that although metals (mercury, and to a lessor extent arsenic) are present in concentrations exceeding ATSDR comparison values, there are no completed or anticipated human exposure pathways associated with the site under present conditions.

The site is an inactive industrial facility. Although physical hazards exist on the site, it is not an area where trespassing is likely. Off-site contact by adults or children with site related contaminants is unlikely under present conditions.

Level D protection is adequate for visiting the site under present conditions. Additional activity by the ATSDR or the NJDOH is not indicated at this time. The NJDOH recommends revisiting the site subsequent to commencement of remedial activity by the USEPA.

c./with attachments

File

Attachment B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

DATE: JUL 0 3 1996

SUBJECT: Screening-level Ecological Risk Assessment for LCP

FROM: Christopher A. Stitt, Environmental Scientist
Surveillance and Monitoring Branch (ESD-SMB)

TO: Nicholas Magriples, On-Scene Coordinator
Removal Action Branch (ERRD-RAB)

As you requested, we have reviewed the existing data for the LCP Chemicals, Incorporated site, located in Linden, Union County, New Jersey. We provide the following screening-level ecological risk assessment for this site.

The LCP site is currently being addressed through the initial stages of the removal process, so extensive knowledge of the magnitude and extent of contamination is not available. Activities at the site revolved around the production of chlorine using a mercury cell electrolysis process. Wastewater from this process, in the form of a sludge lagoon supernatant containing mercury, was discharged to an on-site creek after passing through a treatment plant or directly from the lagoon during several overflow and breaching events. Mercury related operations were stopped in the early 1980s, including closure and clay capping of the sludge lagoon. Investigation of the site has indicated that the soil on the site and the sediment and surface water of the creek are contaminated with mercury, with concentrations in creek sediment as high as 1,060 mg/Kg. Analytical data contained in the "Final Draft Site Inspection" (SI), prepared by Malcolm Pirnie, Incorporated, and last updated July 24, 1995, were used as the basis for this assessment.

The on-site creek is a small tributary of the Arthur Kill, known as South Branch Creek. It appears to arise on the site from various culverts and/or discharge pipes, before passing along the edge of the former lagoon area. South Branch Creek is tidally-influenced and appears to flow for approximately 1,000 feet before entering the Arthur Kill. Based on review of reference material (i.e., no site visit was conducted), habitat associated with the site appears to include the developed terrestrial portion of the site proper, the channel of the creek adjacent to and downstream of the site, and the wetlands and tidal fringe along the creek and at its mouth at the confluence with the Arthur Kill. As South Branch Creek appears to be a tidal creek with estuarine wetlands, the potential exists for the creek to be used by a number of estuarine aquatic species (e.g., mummichog, fiddler crab) for all life stages, as well as by marine species (e.g., blue crab, weakfish, summer flounder) for spawning and nursery habitat. The actual use of the creek by these species would depend on the specific characteristics of the creek channel and wetlands even if contamination is not considered. However, if these species are present, then they could introduce contamination into the food chain through at least two pathways: accumulation of contaminants by young marine species that may be carried into the marine food chain (e.g., weakfish entering the bay or ocean as an adult and being consumed by a predatory fish), and accumulation by any aquatic or benthic species that may be consumed by avian piscivores.

In the vicinity of the site, there are several important avian breeding areas and rookeries, foraging areas, and wintering habitats. These areas are primarily attractive to wading birds (e.g., herons, bitterns, rails, ibises, sandpipers), but also attract many other birds associated with estuaries, such as gulls, terns, ducks, and raptors. Species recorded as recently breeding in the vicinity of the site include state-listed special animals (e.g., great blue heron, yellow-crowned night heron, little blue heron). Additionally, many state-listed species are recorded as using the area as foraging or wintering habitat (e.g., northern harrier, peregrine falcon). The breeding areas and rookeries include Pralls Island (approximately 2,000 feet east of the site and 1,000 feet east of the mouth of South Branch Creek), Island of Meadows (approximately 2 miles to the south), and Shooters Island (approximately 3.5 miles to the northeast), as well as local watersheds. Within 4 miles of the site, which is an arbitrary radius selected to include the ranges of most of the raptors and the larger birds associated with the rookeries, there appears to be considerable foraging habitat provided by the marshes and mud flats associated with the Arthur Kill and its tributaries. These include, from north to south, the lower Elizabeth River watershed, Old Place Creek, Morses Creek watershed, Piles Creek, Sawmill Creek, Neck Creek, lower Rahway River watershed, Rum Creek, Fresh Kills watershed, Noes Creek, Smith Creek, and Woodbridge Creek watershed. Although the Arthur Kill has been heavily developed and altered, it still has some remnants of high quality salt marsh and tidal wetland that are actively used as critical habitat by many species. It has also been the site of ongoing habitat restoration projects for some of these species. These projects include the salt marsh restoration on Pralls Island, across the Arthur Kill from the site, as part of the mitigation for the 1990 Bayway oil spill, as well as salt marsh restorations on Saw Mill Creek, east of Pralls Island, and on Old Place Creek, north of the site.

Consideration of the potential for ecological risk at the site was divided into two components: the terrestrial risk associated with the developed portion of the site, and the aquatic risk associated with the creek system. While contaminants appear to be significantly elevated on the developed portion of the site, effort was not expended to assess the terrestrial risk because it appears that the terrestrial areas on the site proper offer relatively limited habitat value. However, it should be noted that there is still concern that these areas will continue to act as a source of contamination to areas likely to contain ecological receptors (e.g., the creek). The aquatic system is addressed by assessing the ecological risk based on the sediment and surface water data. As no delineation of the habitat associated with the site is available, it is assumed that South Branch Creek, and all of the area adjacent to South Branch Creek, is a tidal tributary and wetland with ecological value. The available sediment and surface water data from the creek are assumed to be representative of these wetland and tidal fringe habitats; therefore, the results of this assessment of the creek sediment surface water data are viewed as representative of these sensitive environments.

The initial step in this screening-level ecological risk assessment is the comparison of the analytical results from the available sampling to appropriate ecological screening values for the creek media (Tables 1, 2, and 3). Surface water sample locations are numbered from upstream to downstream as SW1 through SW10. The SI notes that the samples are from the creek, as well as outfall pipes or culverts entering the creek. Nevertheless, all of the samples are assumed to be representative of the surface water of the creek for the purposes of this assessment because data regarding flow rates and percent contribution to the surface water volume are unavailable. For

the purposes of this assessment, location SW1 is considered to be upstream, and is not included. Locations SW6 and SW7 are duplicate samples from one location; the data are averaged for use in this assessment. Any non-detects are included in this assessment at one-half of the detection limit (e.g., the mercury result for SW4 of 0.20U ug/L is included in the surface water data as 0.10 ug/L).

For surface waters, the USEPA's Ambient Water Quality Criteria (AWQC) were used as screening values (Federal Register/Vol. 57, No. 246/Tuesday, Dec. 22, 1992/Rules and Regulations, p. 60911; and as revised for specific metals by Federal Register/Vol. 60, No. 86/Thursday, May 4, 1995/Rules and Regulations, p. 22228). It is typically recommended that a screening-level ecological risk assessment use the most conservative value available for comparison, which would be the Criterion Continuous Concentration (CCC), or chronic effects value. However, the initial review of the surface water data indicates that inorganic contaminant concentrations exceeding acute effects levels are widespread in the creek. Therefore, the less conservative acute AWQC value, or the Criterion Maximum Concentration (CMC), is selected for comparison. In accordance with the USEPA's Section 304(a) Criteria for Priority Toxic Pollutants (40 CFR 131.36(b)(1), July 1, 1995), the CMC (acute value) is defined as a water quality criterion to protect against acute effects in aquatic life and is the highest instream concentration of a priority toxic pollutant consisting of a one-hour average not to be exceeded more than once every three years on the average. All of the AWQC values used in this assessment are based on dissolved metal concentration and an assumed Water Effect Ratio (WER) of 1.0. Actual criteria for South Branch Creek would have to be calculated based on a specific creek WER, which is not currently available.

The CMC for mercury is 1.8 ug/L. Of the eight surface water sample locations (SW2, 3, 4, 5, 6/7, 8, 9, 10), all but two have concentrations of mercury exceeding the acute value. Mercury concentrations ranged from undetected, at 0.2 ug/L, to 93 ug/L. It is recommended that the maximum concentration be used for comparison in a screening-level risk assessment to remain conservative. Since the surface water is assumed to be flowing, and may potentially be varying in concentration due to tidal influence, the less conservative mean concentration is considered for this assessment. A mean value for the mercury concentration in the surface water of the creek is 29.7 ug/L. This concentration is still an order of magnitude greater than the CMC. Additionally, the mean concentrations of the inorganic contaminants arsenic, copper, and zinc exceed their respective acute values, while lead and silver each exceed their acute value for at least one location. The results of this screening of the surface water concentrations appears to indicate that acute effects to aquatic biota are possible for the length of South Branch Creek, depending on the influence of tides and flow rates at any given time.

Sediment samples are from the same locations as the surface water locations, and are numbered in the same manner. SED1 is again considered to be upstream of the site for the purposes of this assessment and is not included. Sediment samples are not available for locations 2 and 8. SED6 and 7 are duplicates and the results are averaged. Creek sediments are screened against the Long 1995 values, as they provide a relevant database for estuarine systems (E. Long, et al. 1995. "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine

and Estuarine Sediments." Environmental Management Vol. 19, No. 1, pp. 81-97.). Again, it is recommended that conservative screening values be used in a screening-level ecological risk assessment. For estuarine sediments, these would be the Effects Range-Low (ER-L), which are the lower 10th percentile that are associated with adverse effects. Exceeding the ER-L indicates that the sample concentrations are in a " ... range within which effects would occasionally occur." However, initial review of the sediment data from the six locations (SED3, 4, 5, 6/7, 9, 10) indicates that concentrations of certain inorganics appear to be sufficiently elevated to raise concerns for significant impacts throughout the creek system. As an attempt to estimate the magnitude of this potential, less conservative screening values were again selected. The less conservative values used are the Effects Range - Median (ER-M), which are the median, or 50th percentile, of the effects data and are defined as concentrations " ... that are frequently associated with adverse effects ... " when exceeded. Not only does the maximum detected mercury concentration exceed the ER-M, but all six of the locations contain mercury at least two orders of magnitude greater than the ER-M. Mercury concentrations ranged from 56.9 mg/Kg to 1,060 mg/Kg; the ER-M for mercury is 0.71 mg/Kg. In addition to these apparently significant mercury elevations, arsenic, cadmium, copper, lead, and zinc all have mean concentrations in the creek samples exceeding the ER-M, while nickel and silver each exceed their respective ER-M in at least one location.

The initial review of the available data appears to indicate that there is the potential for ecological risk from mercury and several other inorganics contained in stream sediments and surface waters. The widespread elevation of these inorganic contaminants in the creek surface water and sediment suggests that there is a significant impact to the aquatic and benthic community in the creek. If a significant effect is present throughout the creek, it would likely disrupt the local food chain. Such a disruption of the food chain would probably prevent a complete exposure pathway to upper trophic level receptors in South Branch Creek (e.g., wading birds, raptors). Therefore, modeling of exposure of higher trophic level receptors to contaminants through the food chain is not included because the apparent severity of the potential impacts from surface water and sediment inorganic contamination based on screening values indicates that prey items are not likely to survive in the creek. A complete exposure pathway through the food chain is not believed to exist due to contamination. However, the continuing elevation of these contaminants, specifically mercury, in the surface water even after the cessation of operations and the efforts to contain the lagoon raises concern that the sediment and/or other on-site areas are acting as a continuing source to the environment. There also are no data regarding contamination in the sediment and surface water beyond the most downstream sample in South Branch Creek (SW10). The historical and ongoing contribution of potentially adverse concentrations of contaminants to the Arthur Kill by South Branch Creek has not been addressed. Additionally, while the predicted impacts may be limited to the aquatic and benthic community of South Branch Creek, there remains the concern that there is a zone of mixing in the Arthur Kill in which concentrations are not directly toxic to the aquatic and benthic organisms but do accumulate in their tissue. This may result in an undefined area in which adverse impacts to higher trophic level ecological receptors, such as the wading birds and raptors, may be occurring through the food chain. This is of particular concern for two primary reasons: the bioaccumulative property of mercury, and its impacts to reproductive activities.

A cursory review of the "Mercury Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review" (R. Eisler. April 1987. Biological Report 85(1.10). Contaminant Hazard Reviews Report No. 10. U.S. Fish and Wildlife Service) reveals that there is no known biological function for mercury. While some forms may have relatively low toxicity or bioavailability (e.g., inorganic mercury), other forms easily enter the food chain through strong bioaccumulative properties (e.g., organomercury compounds). Biological activities can transform the less toxic forms of mercury into the more toxic and bioavailable forms, such as the methylation of mercury in anaerobic sediments. Finally, mercury is known to be a mutagen, teratogen, and carcinogen, and to cause embryocidal, cytochemical, and histopathological effects. The potential for mercury to enter the food chain in the vicinity of the South Branch Creek and to impact the breeding populations of wading birds and raptors in the area, including state-listed endangered and threatened species, remains a concern of undefined potential. It is recommended that additional activities be conducted to address the potential ecological risk associated with contamination of South Branch Creek to protect the environment.

The nature of a screening-level ecological risk assessment and the limited data available for this site precludes definitive conclusions regarding the significance of any effects that may actually be occurring in the field. However, the uncertainties can be clarified so that any risk management decisions that must be made can be as informed as possible. The following are, first, factors which may decrease the uncertainty or increase the potential that significant ecological effects may be occurring in the field and, second, factors which are common to screening-level ecological risk assessments that may increase the uncertainty.

South Branch Creek represents an ongoing source of mercury into the environment. The area surrounding the creek is used for breeding, foraging, and wintering of numerous species. Breeding is typically a time of increased susceptibility to environmental factors, such as contamination. Additionally, mercury is known to cause adverse impacts in the development of young and the reproductive cycle in birds. The presence of mercury in this area may therefore present an even greater risk than this assessment indicates. While mercury appears to be the primary contaminant of concern for this site, several other inorganic contaminants have significantly elevated concentrations in South Branch Creek. Additionally, concentrations of PAHs and PCBs were detected in the sediment samples. These contaminants were not considered in this assessment because it was assumed that the inorganic contaminants generate the greatest risk. However, the organic contaminants may contribute additional risk to benthic and aquatic receptors, while contaminants such as the PCBs may also enter the food chain. Therefore, while there may be uncertainty that any one contaminant is actually causing impacts in the field, a qualitative assessment of the number of contaminants present at elevated concentrations, the relative number of locations with concentrations exceeding screening values, the total number of separate inorganic constituents exceeding screening values at each of these locations, and the magnitude by which the screening values are exceeded would appear to reduce the uncertainty. It should also be noted that terrestrial ecological risk was not assessed. While terrestrial risk was assumed not to be significant for this assessment due an apparently limited potential for exposure, any effects to the biota from the contaminants in this habitat may add to any impacts from the aquatic media. Finally, it is typically recommended that the screening values for an assessment

such as this be based on the most conservative values available. Therefore, the CCC, or chronic effect level, for surface water and the ER-L for sediment should be used to be appropriately conservative to support the dismissal of the potential for risk if these values are not exceeded. As this screening-level ecological risk assessment was being prepared as part of a removal investigation and because of the high concentrations of the contaminants being assessed, the less conservative CMC, or acute effects level, for surface water and ER-M for sediments were used. This indicates that if potential ecological risk is found in the assessment, then there may be a higher probability that effects are actually occurring in the field. It may also mean a higher probability that any effects that are occurring in the field may be significant adverse effects. The use of the less conservative screening values is intended to reduce the uncertainty of the risk assessment. This was done to facilitate supporting risk management decisions associated with potential removal actions; decisions that often must be made even if conducting field investigations and/or confirmatory studies is not feasible.

The AWQC for surface water can be influenced by site-specific parameters. The pH and salinity are examples of parameters that can influence the bioavailability and/or toxicity of contaminants in estuarine surface water. These parameters were not available for use in this assessment, so the comparison to the AWQC may actually include more or fewer exceeded values. Grain size distribution, total organic carbon content, reduction-oxidation potential, pH, aerobic state (aerobic/anaerobic), and other factors can influence the bioavailability and/or toxicity of contaminants in the sediment. Without these parameters, the actual availability and toxicity of the sediment contaminants to biological receptors is unknown, regardless of the indications of screening values. An assessment of the food chain is not included because of the assumption that a complete exposure pathway to higher level trophic receptors does not exist due to the apparent toxicity of the creek. However, there would appear to be a high potential that contaminants are being transported out of South Branch Creek and into the Arthur Kill, where the potential for food chain uptake is undefined. All of these factors contribute to the uncertainty of this assessment of ecological risk; however, it should be noted that these uncertainties can actually influence the results in both directions (i.e., more and less conservative).

Based on the results of this screening-level ecological risk assessment, it is our recommendation that additional activities be conducted to address the contamination in the creek system. If additional ecological investigations cannot be performed, then due to apparent toxicity of the creek to aquatic and benthic species and the potential for highly toxic and/or bioaccumulative contaminants to be transported off of the site at highly elevated concentrations and effect piscivorous or other predatory species, it may be appropriate for the areas of highest stream sediment contamination (hot spots) to be removed and ongoing sources to the creek from the site to be eliminated. Any such action may serve to reduce the potential ecological risk and serve to protect the environment.

We hope these comments have been helpful. The BTAG and/or ESD is interested in reviewing any future documents pertaining to this site. If you have any questions, comments, or require further information, please contact me at (908) 321-6676.

Attachments

TABLE 1. LCP CHEMICALS, INC.

Surface water inorganic data.

Location	As	Cu	Hg	Zn
SW 2	97.4	38.6	30.5	52.9
SW 3	54.9	106.0	**93.0**	329.0
SW 4	73.5	0.6	0.1	137.0
SW 5	127.0	29.4	44.6	303.0
SW 6/7	**231.0**	**331.5**	62.8	**878.0**
SW 8	65.1	4.2	1.0	33.7
SW 9	62.9	5.6	2.0	47.6
SW10	23.8	27.1	3.7	74.4
Mean	92.0	67.9	29.7	232.0

(All analytical data from the "Final Draft Site Inspection LCP Chemicals, Inc.," Reference No. 17.)

(All surface water concentrations are in ug/L.)

(Bold data indicate maximum detected contaminant concentration.)

(Undetected results ("U") calculated as 1/2 detection limit; Duplicate samples averaged.)

TABLE 2. LCP CHEMICALS, INC.

Sediment inorganic data.

Location	As	Cd	Cu	Pb	Hg	Zn
SED 3	115.0	16.5	383.0	**358.0**	**1,060.0**	1,030.0
SED 4	**318.0**	3.2	65.6	82.3	429.0	777.0
SED 5	80.3	**132.0**	201.0	182.0	187.0	**9,040.0**
SED 6/7	156.5	6.4	271.5	262.0	410.0	469.0
SED 9	90.0	7.6	**389.0**	268.0	433.0	526.0
SED10	75.4	4.5	327.0	312.0	56.9	502.0
Mean	139.2	28.4	272.9	244.1	429.3	2,057.3

(All analytical data from the "Final Draft Site Inspection LCP Chemicals, Inc.," Reference No. 17.)

(Bold data indicate maximum detected contaminant concentrations.

(All sediment concentrations in mg/Kg.)

(Undetected results ("U") calculated as 1/2 detection limit; Duplicate samples averaged)

TABLE 3. LCP CHEMICALS, INC.

Surface water and sediment inorganic maximum and mean concentrations compared to screening values.

	Media concentration		Screening value	
Surface water	Maximum	Mean	acute	chronic
As	231.0	92.0	69.0	36.0
Cu	331.5	67.9	2.4	2.4
Hg	93.0	29.7	1.8	0.025
Zn	878.0	232.0	90.0	81.0

(Additionally, Pb and Ag have at least 1 location with concentrations exceeding the acute screening value.)

Sediment	Maximum	Mean	ER-M	ER-L
As	318.0	139.2	70.0	8.2
Cd	132.0	28.4	9.6	1.2
Cu	389.0	272.9	270.0	34.0
Pb	358.0	244.1	218.0	46.7
Hg	1,060.0	429.3	0.71	0.15
Zn	9,040.0	2,057.3	410.0	150.0

(Additionally, Ni and Ag have at least one location with concentrations exceeding the ER-M screening value.)

(Surface water acute value is the unadjusted AWQC saltwater CMC; surface water chronic value is the unadjusted AWQC saltwater CCC.)

(Sediment ER-M and ER-L values from Long, et al. 1995.)

(All surface water concentrations in ug/L; all sediment concentrations in mg/Kg.)